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ON THE CLASSIFICATION OF MUSEUM SPECIMENS.¹

With an Exposition of a Decimal Classification of Museum Specimens Applied in the Pathological Museum of McGill University, After a Plan Suggested by the Late Professor Wyatt Johnston.

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The progress of modern professional education being always toward more objective teaching in all departments, the importance of the medical museum in this connection increases constantly, and in a university the uses of the museum as a storehouse for the curiosities of medicine or for the materials of scientific research are naturally subordinated to its value in the practical assistance it can lend the teacher by placing at his hand the fullest illustration of the varying facts which he seeks to impress upon the student.

Further, in the department of pathology, museum preparations have of late years been made of infinitely greater value to the teacher by the introduction of methods for preserving the natural colors of organs. The discovery of these methods was announced in the year 1896 by three independent workers—Melnikow-Raswedenkow, Jore, and Kaiserling.² These methods, one or other of which is now the routine practice in almost all the leading museums, depend on the action of, first, formalin, and then alcohol, on the blood-coloring matter in the tissues, the formalin reducing the hemoglobin to brown acid hematin, and the alcohol changing this again to the red alkaline hematin, a substance closely resembling oxyhemoglobin in color, but which remains fixed in the tissues and does not undergo further change.

Under the right employment of these methods there is now no longer a "Museum Pathology" in which the peculiar appearances of the museum specimen must be acquired for examina-

¹ Read before the meeting of the Canadian Medical Association, Montreal, September 18, 1902.

² Puppe: *Vierteljahrsschrift für gerichtliche Medizin*, 2 Folge, xvii, 2.

tion purposes by the hard-worked student. Today a well prepared museum specimen, its colors preserved almost as in life, properly mounted to resemble as closely as possible its position in the body, and carefully dissected to display the extent and relations of the lesions, presents appearances very similar to those of the postmortem-room, and sometimes shows the morbid process even more clearly and with greater advantage to the student. At the meeting of the Berliner Med. Gesell., of July 8, 1896, at which Dr. Kaiserling first announced his method, Professor Virchow stated that he believed the use of this process for the preservation of the natural colors of organs would inaugurate a new era in the demonstrative teaching of pathology, and already it may be said to have done so.

Virchow's own institute—the new Pathological Museum of Berlin—is a good example of the extensive use to which a large collection of fine specimens can be put in teaching. This museum, which was formally opened last year at the festival of Virchow's eightieth birthday, is a large, four-story brick building devoted entirely to pathologic museum specimens, to museum preparation rooms, and lecture theater, and contains about 20,000 specimens. Among these are many full series of the finest colored preparations. These are used singly to illustrate conditions studied for the first time, in groups for comparison and differential diagnosis, and also (and this especially) in large numbers for purposes of rapid review. In Virchow's own words, written at the time of the opening:

Thus will the student prepare himself for the difficult art of forming for himself, out of the confusing many-sidedness of pathologic appearances, a general idea of a diseased process, even in those cases in which direct observation is impossible.¹

So soon as a museum collection becomes of any size the question of its scientific classification is of primary importance. This not only for the convenience of the teacher and the curator, but also for the sake of making the material as it stands on the shelves accessible and of most advantage to the student. For this reason a useful classification must be based on teaching principles.

Pathologic material will be approached by the teacher from the standpoint of (a) general pathology, the study of the same morbid condition as it appears in different organs and tissues; (b) special pathology, the study of the same organ as it is affected by different diseases, and (c) regional pathology, the study of a portion of the body, such as the head or abdomen, according as it is affected by different diseases.

Virchow: Das neue Pathologische Museum: z. Berlin, Berlin,

Any classification will naturally be based on one of these divisions, and in a large collection where specimens are duplicated all three may be followed. Thus in the great Army and Navy Museum at Washington there are three full sets of specimens. First one finds diseases and injuries of regions, in which morbid processes involving the head, thorax, abdomen and extremities are grouped together; second, diseases of organs where groups of pathologic conditions affecting the different parts of the circulatory, nervous, digestive and other systems follow each other; and third, one sees illustrations of the same diseased process, *e. g.*, tuberculosis, syphilis, infarction, as it affects the different organs of the body.

In the great Museum of the College of Surgeons of London, as also in the small but beautifully ordered Museum of Charing Cross Hospital, an anatomic classification is followed throughout, specimens being subclassified pathologically under the main divisions of the organ in which they occur. For a smaller teaching museum, such as college museums are likely to be, where specimens are not often present in duplicate, this last named arrangement would seem to be the most practical. That is, that an anatomic classification be followed and the different morbid processes affecting each organ be subclassified under it, general and regional pathology being provided for by cross cataloguing. Especially characteristic groups of morbid conditions, such as calculi, parasites, etc., may be placed together as departments of general pathology.

The general plan of classification having thus been mapped out, a less prominent but no less important problem is the method in which the preparation shall be numbered so that it will remain in the order to which it has been assigned, perhaps after some study. The specimen must either bear the number of its shelf or its catalog number must be made to give an index to the place to which it belongs on the museum shelves. I have the honor to present in this paper a system of descriptive catalog numbers which has recently been applied in the Pathologic Museum of McGill University. These catalog numbers have a logical sequence and are based on a scientific classification of which the main grouping is anatomic and the subdivisions pathologic.

For the suggestion of this classification the museum committee is indebted to the late Professor Wyatt Johnston, with whom also the pathologic portion of the classification was original.

To devise a good working system of catalog numbers that will not require frequent change is a problem that has exercised museum workers everywhere, and has nowhere as yet been satisfactorily solved. It has generally, indeed, been set

aside as less important than the time which it would take to elaborate it. What is required is a system of numbers which will run in numerical rotation in the museum and will yet allow of the addition of new specimens in the division of the classification to which they belong without disturbing this numerical order.

In the College of Surgeons of London, as in the Charing Cross Museum, which has lately been completely recatalogued under Dr. Hunter, only one set of consecutive numbers is used, and these numbers follow each other in rotation all through the museum. Gaps are left in the series for new specimens, and new duplicate specimens are distinguished from the original by a small letter. Thus: 1001, Tuberculous Pericarditis, 1001a, ditto.

The objection to this method is that it does not allow for the growth of the museum. When new specimens have exhausted all the numbers of the gaps that have been left in the series or have occupied all the shelf room that has been left empty for them, an extension means a complete renumbering of the collection in order to preserve the rotation. A descriptive number is needed which will be common to each group of specimens, some additional letter or figure being added to distinguish the particular specimen from another of the same group. This has been attempted in the Army and Navy Museum, Washington. Here a descriptive number is used; it is made up of letters to represent the anatomic, and figures to represent the pathologic condition, while the particular specimen is indicated by a figure placed after a decimal point. Thus, for instance, capital D. would represent the circulatory system, little a. the heart, and 3 anomalies. All specimens showing anomalies of the heart are labeled Da3, the individual specimens of this condition would be Da3.1, Pa3.2, Da3.3, etc.

If I may venture to criticize so excellent a museum, it appears to me that in the Army and Navy collection the idea lying behind this descriptive number has not been systematically carried out in its application, so that it does not altogether answer the purpose for which it was intended. The classification on which the numbers are based does not attempt to be a complete one, only a few headings being used, and these not always exhausting the main divisions of the subject, nor following each other in the order in which we are accustomed to think of them. So that not only is it often difficult or even impossible to classify a specimen under the headings that the catalog numbers furnish, but also it is impossible to observe the numerical order in the different groups without disturbing the natural order in which the specimens should stand.

THE CLASSIFICATION OF SPECIMENS IN THE PATHOLOGICAL
MUSEUM OF MCGILL UNIVERSITY.

In the year 1897 this museum was renovated and put in order under the direction of Professor Adams. At this time the specimens were grouped on an anatomic classification, with a pathologic subclassification, and a corresponding descriptive catalog number made up of letters and figures, as in the Army and Navy Museum, was used. The classification employed, however, as was necessary in any attempt to get the whole mass of material into order in a short time, was too broad to be adequate for permanent purposes. The few divisions made were soon found insufficient for classifying purposes, as they could not indicate the whole range of pathologic possibilities.

In the year 1899 the late Professor Wyatt Johnston laid the decimal system of classification and catalog numbers, which is the subject of this paper, before the Museum Committee. It was adopted and applied and the collection catalogued upon it.

In its application this system has been found to meet all the requirements of the case. Its decimal character admits of its being extended in any one direction or of its being modified in any one particular at will, and specimens can be kept in order on the shelves without the help of skilled labor.

The general principles of this classification may be summed up as follow:

A full classification, both anatomic and pathologic, is aimed at, in which there is a logical sequence of ideas. The anatomic condition is made the main classification and the pathologic condition a subclassification under it. In the anatomic classification organs are made to follow each other, so far as possible, in their relations in the body. Thus, the respiratory system runs: 21, nose; 22, larynx; 23, trachea and bronchi; 24, lungs; 25, pleura, passing from the surface inward. So also in the pathologic classification, anomalies, circulatory disturbances, inflammations, progressive and retrogressive changes follow each other in the order in which they are generally presented to the student.

The descriptive numbers are made up of figures only. A decimal point is used, and the anatomic condition is represented by numbers before, the pathologic by numbers after the decimal point. The particular specimen is indicated by a small index figure to the right of the full number.

The Dewey system of library classification is followed. This is a decimal system. The set of numbers before and after the decimal point each represent a complete classification in themselves. In each classification there is a division into ten main groups, and each of these groups may be divided

at will into ten or less subgroups, each of which may again be subdivided into ten, and so on indefinitely.

The Anatomic Classification.—This is the main classification. The numbers representing its divisions precede the decimal point in the catalog number. With a few insignificant modifications it is the work of Dr. Haviland Field, of Zurich, and was devised by him for use in medical libraries under the Dewey system.

1. CIRCULATORY SYSTEM:

- 11. Pericardium.
- 12. Heart and Myocardium.
- 13. Endocardium.
- 14. Arteries.
- 15. Veins.
- 16. Capillaries.
- 17. Blood.
- 18. Lymphatic Vessels.

2. RESPIRATORY SYSTEM:

- 21. Nares.
- 22. Larynx.
- 23. Trachea and Bronchi.
- 24. Lungs.
- 25. Pleura.

3. DIGESTIVE SYSTEM:

- 31. Teeth.
- 32. Mouth, Tongue, etc.
- 33. Pharynx and Esophagus.
- 34. Stomach.
- 341. Stomach Contents.
- 35. Intestine.
- 351. Small Intestine.
- 352. Appendix and Cecum.
- 353. Large Intestine.
- 354. Rectum.
- 355. Intestinal Contents.
- 36. Peritoneum and Mesentery.
- 37. Liver.
- 38. Gallbladder and bile-ducts.
- 39. Pancreas.

4. LYMPHATIC SYSTEM AND DUCTLESS GLANDS:

- 41. Speech. Lymphatic Glands.
- 42. Thymus Gland.
- 43. Thyroid Gland.
- 44. Spleen.
- 45. Suprarenals.

5. UROGENITAL SYSTEM:

- 51. Kidney.
- 52. Ureter.
- 53. Bladder.
- 54. Urethra.
- 55. Penis.
- 56. Prostate.
- 57. Seminal Vesicles, Vas Deferens and Cord.
- 58. Testes, Epididymus and Tunica Vaginalis.
- 59. Scrotum.

6. FEMALE GENERATIVE SYSTEM:

- 61. Vulva.
- 62. Vagina.
- 63. Uterus.
- 64. Tubes.
- 65. Ovaries.
- 66. Broad Ligament.
- 661. Parovarium.
- 67. Mamma.
- 68. Gravid Uterus.
- 69. Ovum.
- 691. Membranes.
- 692. Placenta.
- 693. Fetus.

7. NERVOUS SYSTEM:

- 71. Dura Mater.
- 72. Pia Mater.
- 73. Brain.
- 74. Medulla and Pons.
- 75. Spinal Cord.
- 76. Nerves.
- 77. Sympathetic System.
- 78. Eye.
- 79. Ear.

8. TEGUMENTARY AND MUSCULAR SYSTEMS:

- 81. Skin,
- 82. Hair,
- 83. Nails,
- 84. Muscle and Fascia,
- 85. Cellular Tissues.

9. OSSEOUS AND ARTICULAR SYSTEMS:

- 91. Bones of Cranium,
- 92. Bones of Face,
- 93. Vertebrae,
- 94. Sternum,
- 95. Ribs,
- 96. Bones of Upper Extremity,
 - 961. Scapula,
 - 962. Clavicle,
 - 963. Shoulder-joint,
 - 964. Humerus,
 - 965. Elbow-joint,
 - 966. Bones of Forearm,
 - 967. Wrist-joint and Joints of Hand,
 - 968. Bones of Hand,

97. Pelvis,

- 98. Bones of Lower Extremity,
 - 981. Os Ilium,
 - 982. Hip-joint,
 - 983. Femur,
 - 984. Knee-joint,
 - 985. Bones of Leg,
 - 986. Joints of Ankle and Foot,
 - 987. Bones of Foot.

10. REGIONAL:

- 01. Head,
- 02. Face,
- 03. Neck,
- 04. Trunk,
- 05. *Abdomen*
- 06. *Pelvis*
- 07. *Upper Extremity*
- 08. *Lower Extremity*
- 09.

The Pathologic Classification.—This is the subclassification. The numbers representing its divisions follow the decimal point in the catalog number:

1. ABNORMALITIES:

- 1.1 *Abnormalities of the fetus*
 - 1.11 Persistent fetal structures,
 - 1.12 Defective closure of fetal openings,
 - 1.13 Fetal disease,
 - 1.14 Malposition of parts,
 - 1.15 Suppression of parts,
 - 1.16 Excess of parts,
 - 1.17 Duplication of parts,
 - 1.18 *Reproduction, foetal disease*
 - 1.19 *Teratomas, Double monstrosities*
 - 1.20
- 1.2 *Aberrant structures.*

2. INFLAMMATIONS:

- 2.1 *Parachymatous degeneration*
- 2.2 Cellular or catarrhal inflammation,
- 2.3 Serous inflammation,
- 2.4 Fibrinous or croupous inflammation,
- 2.5 Diphtheric inflammation,
- 2.6 Hemorrhagic inflammation,
- 2.7 Purulent inflammation,
- 2.8 Destructive inflammation,
- 2.9 Productive inflammation.

3. CIRCULATORY DISTURBANCES:

(Abnormal distribution of blood and lymph)

- 3.1 Anemia,
- 3.2 Hyperemia,
- 3.3 Hemorrhage,
- 3.4 Thrombosis,
- 3.5 Embolism,
- 3.6 Infarction,
- 3.7 Edema.

4. INFECTIONS AND PARASITES:

- 4.1
- 4.2 Pyogenic cocci,
- 4.3 Bacilli,
- 4.4 Spirilla,
- 4.5 Yeasts and molds,
- 4.6 Protozoa,
- 4.7 Vermes,
- 4.8 Vermes,
- 4.9 Arthropods.

General Nutritional 5 GRANULOMAS AND GENERAL DISEASES. *Diseases.*

- .51 Tubercle,
- .52 Lupus,
- .53 Syphilis,
- .54 Glanders,
- .55 Actinomycosis,
- .56 Diseases of the blood,
- .57 Nutritional diseases,
- .58 Gouty rheumatic group.

6 PROGRESSIVE CHANGES:

(a) *Regenerative changes.*

- .61 Regeneration,
- .62 Hypertrophy,
- .63 Histoid tumors,
- .64 Histoid tumors,*
- .65 Sarcoma,
- .66 Sarcoma (mixed forms),
- .67 Cyst formation and teratomas,
- .68 Benign epithelial tumors,
- .69 Carcinoma.

7 RETROGRESSIVE CHANGES:

- .71 Atrophy,
- .72 Necrosis,
- .73 Gangrene,
- .74 Degenerations,
 - .741 Parenchymatous,
 - .742 Fatty, *macula*
 - .743 Hyaline,
 - .744 Amyloid, *Colloid*
 - .745 Caseous,
 - .746 Calcification,
 - .747 Pigmentary,
 - .748 Cystic degeneration,
- .75 Ulceration and abscess formation, /
- .76 Perforation and rupture due to disease,

- .77 Dilation due to disease.
- .78 Stenosis due to disease.
- .79 Calculus formation.

8 WOUNDS AND INJURIES:

- .81 Wounds,
- .82 Ruptures and lacerations,
- .83 Gunshot wounds,
- .84 Fractures, /
- .85 Dislocations,
- .86 Sprains,
- .87 Corrosion,
- .88 Poisons,
- .89 Foreign bodies,
- .90 Abortion.

9 SPECIFIC ARTEFACTS:

- .91 Amputation,
- .92 Excisions,
- .93 Plastic operations,
- .94 Ligatures,
- .95 Miscellaneous operations,
- .96 Tattooing,
- .97
- .98 Gas formation,
- .99 Postmortem changes,
- .90

10 GENERAL SUPPLEMENTARY:

- .01
- .02
- .03
- .04
- .05
- .06
- .07
- .08
- .09

A glance at the details of this system as it is applied in the museum will illustrate what, although it may appear complicated, is really a very simple principle. The whole collection is divided into 10 main divisions, the 10 systems of the anatomic classification, and the organs of each system are arranged under it. Under each organ again the lesions affecting it are classified, while the individual specimens showing the same condition stand in the rotation of their index figures. Thus, the first department is lettered: 1. Circulatory System, and its

* Where a term is repeated it signifies that the possible subdivisions being more than 10, 20 instead of 10 places are allowed for convenience in classification.

first division: 11. Pericardium. The specimens showing inflammations of the pericardium read as follows on the shelves:

- 11.23¹ Ecchymoses into pericardial layers.
- 11.34¹ Acute fibrinous pericarditis, moderate degree of "Cor Villosum."
- 11.34² Acute fibrinous pericarditis. Fine example of "Cor Villosum."
- 11.34³ Subacute serofibrinous pericarditis.
- 11.34⁴ Acute serofibrinous pericarditis. Pericardial cavity enlarged. Both layers covered with a granular deposit having a flattened surface and peeling off in flakes.
- 11.34⁵ Subacute serofibrinous pericarditis.
- 11.36¹ Hemorrhagic pericarditis.
- 11.37¹ Purulent pericarditis. Greatly enlarged pericardial cavity, which contained postmortem a pint of pus.
- 11.37² Subacute purulent pericarditis. Both surfaces covered with a phlegmonous sloughy bloodstained surface.
- 11.39¹ Chronic adhesive pericarditis, pericardium adherent anteriorly, the layers widely separated posteriorly to contain a large cavity. Both layers are thickened and lined by organized tissue.
- 11.39² Chronic adhesive pericarditis.
- 11.39³ Chronic pericarditis with localized adhesions.
- 11.39⁴ Chronic mediastinopericarditis. The outer surface of the parietal pericardium is adherent to the pleura covering the right lung, also firmly united to diaphragm below and anteriorly.
- 11.39⁵ Chronic adhesive pericarditis. A filmy layer of organized tissue unites the opposed surfaces at all points. Etc., etc., etc., etc.

The anatomic classification is followed in the museum, into all its details, and cards bearing the title of each division, with its corresponding number, are placed over the shelves where each organ is to be found. These subdivisions form the most convenient point in the whole system. Thus, after 34, Stomach, a compartment is found, 341, Stomach Contents; after 35, Intestine (under which are classed lesions affecting the intestine as a whole, such as "hernias"), comes 351, Small Intestine; 352, Appendix and Cecum; 353, Large Intestine; 354, Rectum; 355, Intestinal Contents. Again, the obstetric collection arranges itself naturally at the end of the gynecologic department.

In the pathologic classification, on the other hand, the intent has been to avoid subdivision wherever possible. Although a full table of possible conditions has been made out, the subheadings are used only in those cases in which there are many variations of a given lesion. Thus, "Anomalies" of the pericardium, being rare, would be all classed together, 11.1¹, 11.1², 11.1³, etc., while "Anomalies" of the heart itself, being many and varied, would be subclassified under this head as 12.11¹, 12.12¹, 12.13¹, etc., according to the condition.

In working out this system in the museum, one or two

possible alterations have suggested themselves. If the anatomic classification were altered to: 1. Digestive System. 2. Respiratory System. 3. Circulatory System. 4. Glandular System. 5. Urogenital, etc., the lymphatic vessels with which the circulatory system ends would stand next to the lymphatic glands, and the suprarenals, with which the glandular system ends, would stand next to the kidney, with which the Urogenital begins. But this is a minor point, and it seems not worth sacrificing to it the natural order which would certainly begin the open book which the museum aims at making itself to the students with the circulatory system.

The pathologic classification presents, in the nature of the subject, many difficulties. In the present state of our knowledge it is not like an anatomic classification, based on certain well-established facts, it is largely tentative, for our ideas of pathologic conditions change constantly with the increase of our knowledge. One has only to glance at the repeated changes that are being made, for instance, in the Bertillon classification of the causes of death, to realize how impossible a permanent nomenclature will be, at least for many years to come. All that can be done is to classify so far as possible on the actual pathologic changes known to be present, rather than on any supposed etiology.

The advantages of this system may be summed up as follows:

First. A careful classification is, as has been said at the outset, absolutely necessary to make a museum of thoroughly practical use to teacher or student. A careful system of catalog numbers which follows the classification into its details, so far as one wishes to push it, is of inestimable use to the curator in meeting this requirement. The catalog number chosen carefully and with study to describe the condition cannot fail of its numerical order in relation to other specimens of the same kind, and the preparations can then be kept in their appointed order by any boy who follows the one order that he is to watch the figures closely and place the specimens under their main group in the strict rotation of their index figure.

Second. The system allows of an indefinite growth of the museum, for it is expansive, permitting the addition of an indefinite number of specimens without any disturbance of either the grouping or the numerical order.

Third. It admits of subclassification to an indefinite extent in any one direction that may seem desirable. Thus, supposing that the museum is particularly rich in tumors, or that the curator devotes much time to working out this particular department, he can subdivide, *e. g.*, Sarcoma—.65 Sarcoma; .651 Round-celled sarcoma; .652 Spindle-celled sarcoma; .653 Giant-

celled sarcoma—and so on indefinitely. In short, this system is an aid to exact definition which is the basis of accuracy.

We believe that some form of decimal classification has been contemplated in several museums on this continent and has already been introduced in one or two places, as in the Museum of Biology and Zoology at Manchester, England; in the Pathologic Museum at Newcastle-on-Tyne, and in the Pathologic Laboratory of Professor Ira Van Gieson. But we do not know the details of the systems adopted or the degree of success which has attended them. The classification applied in the Pathologic Museum of McGill University, and given in detail in this paper, has now been in working order for more than a year and has proved itself thoroughly satisfactory in meeting the requirements alike of teacher, curator and student. In view of this fact we have thought it important to put it fully upon record in the hope that its utility might be increased by its adoption elsewhere, and that in time, if necessary by modifying and further simplifying wherever possible, a common system of museum classification based on the decimal system might be arrived at.

NOTE.—Dr. Johnston's plan, in its entirety, embraced the medical museum as a whole. The Museums of Anatomy, Pathology, Public Health and Legal Medicine were divisions I, II, III and IV under it, and the subject-matter of each had a decimal classification of its own. Thus, in the Medicolegal Collection the main divisions, 1. Criminology, 2. Thanatology, 3. Traumatism, 4. ———, 5. Tests, 6. Toxicology, 7. Sexual Relations, 8. Mental, 9. Jurisprudence, all precede the decimal point, while Dr. Field's anatomic classification (used as the main headings in the Pathologic Museum) follows the decimal point. But the only one of these classifications that had been fully worked out and applied by us in Dr. Johnston's lifetime was that in the Museum of Pathology. This is therefore the only portion which we feel competent to publish now, deprived as we are of his active cooperation through his recent sad and untimely death.

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